U.S. Environmental Protection Agency
Office of Research and Development

BOARD OF SCIENTIFIC COUNSELORS
MERCURY MULTI-YEAR PLAN SUBCOMMITTEE

Arlington, VA
February 23-24, 2005

Wednesday, February 23, 2005

WELCOME, INTRODUCTIONS, AND OVERVIEW

Dr. Herb Windom, chair of the Board of Scientific Counselors (BOSC) Mercury Multi-Year Plan (MYP) Subcommittee called the meeting to order at 9:00 a.m. He welcomed the participants and asked each of the attendees to introduce themselves. Following the introductions, Dr. Windom gave a brief overview of the agenda and the purpose of the meeting. The agenda is included as Attachment 1.

This was the second of three scheduled meetings. The first meeting was a conference call on January 19, 2005, during which the subcommittee established a process for addressing charge questions and developing a letter report for the BOSC Executive Committee. In the weeks following the conference call, the subcommittee worked in groups of two to address six charge questions. At the present meeting, after several morning presentations and a break for lunch, spokespersons for each charge question reported on their responses to the charge questions and received input from other participants. After these discussions, the participants broke into three subgroups and redrafted the responses to reflect the consensus of the subcommittee. The following morning, the three subgroups reported on their revised responses, and the subcommittee discussed them further. At the end of the meeting on February 24, the subcommittee reached consensus on the substance of the responses to the charge questions. This will be the basis for the letter report to the BOSC Executive Committee. The draft responses are included as Attachment 2.

The third Mercury MYP Subcommittee meeting will be a conference call on March 29, 2005, to review the draft letter report. The final draft letter report is scheduled to be submitted to the Executive Committee at a meeting on May 29, 2005.

REMARKS FROM THE DESIGNATED FEDERAL OFFICER
Heather Drumm, Office of Science Policy (OSP), EPA

Ms. Drumm thanked the subcommittee and presented background information on the BOSC, a federal advisory committee that provides independent scientific peer review and advice to the Environmental Protection Agency's (EPA's) Office of Research and Development (ORD). The BOSC Executive Committee established the Mercury Subcommittee to review the Mercury

MYP and provide a report based on the charge questions. The Executive Committee will review, revise, and approve the report, which will be submitted to the Assistant Administrator for Research and Development.

As DFO for the subcommittee, Ms. Drumm serves as the liaison between the subcommittee and the Agency. She is responsible for ensuring the subcommittee's compliance with the requirements of the Federal Advisory Committee Act rules, which include the following:

- ✧ All subcommittee meetings on substantive issues, whether by phone, e-mail, or in person, are open to the public, including any group communications that involve at least one-half of the subcommittee. Issues that are solely administrative or preparatory are exempt from this requirement.

- ✧ A *Federal Register* notice must announce all meetings 15 calendar days in advance. Notice for this meeting was published on December 30, 2004.

- ✧ The DFO must approve the agenda and attend all meetings.

- ✧ The chair of the subcommittee must certify the meeting minutes within 90 days of the meeting.

- ✧ All advisory committee documents must be made available to the public.

The DFO also ensures that all appropriate ethics regulations are satisfied. Each of the subcommittee members has filed a standard government financial disclosure report and has completed the required annual ethics training. Ms. Drumm stated that she had received a request from one member of the public to participate in this meeting, and that time would be allotted for public comments at 12:00 noon. At the conclusion of her comments, Ms. Drumm turned the meeting over to the first presenter.

EPA'S MERCURY PROGRAMS
Nancy Wilson, Office of Pollution Prevention and Toxics, EPA (substituting for Maria Doa)

Ms. Wilson presented a brief overview of EPA's mercury-related programs. PowerPoint slides of her presentation are included as Attachment 3.

Currently, EPA focuses on six major areas related to mercury:

- ✧ Reducing mercury releases to the environment
- ✧ Reducing mercury uses in products and processes
- ✧ Managing commodity-grade mercury supplies
- ✧ Communicating risks to the public
- ✧ Reducing international sources
- ✧ Conducting mercury research and monitoring.

Success in reducing mercury pollution and exposure depends on pursuing all of these areas simultaneously. Accordingly, EPA's future direction will include a comprehensive approach.

Reducing Air Releases

EPA's air program is focused on a suite of regulatory and legislative actions established to reduce mercury air emissions, including the Clean Air Mercury Rule, the Clean Air Interstate Rule, and the President's proposed Clear Skies Initiative. When the Clean Air Mercury Rule is promulgated in March 2005, EPA will have its air regulations in place for the remaining large point sources. After that, EPA's air program will focus on smaller sources through the Clean Air Act's area source program. This is outlined in the Urban Air Toxic Strategy, and is expected to be the future of the air program. There are over 70 area sources that, cumulatively, are significant contributors. The program will focus, by requirement, on these 70 sources.

Reducing Water Releases

The major focus in reducing mercury in water continues to be relating air deposition to mercury in fish and tissue levels. The challenge is to use the National Pollutant Discharge Elimination System (NPDES) permitting programs and Total Maximum Daily Loads (TMDLs) to manage an air problem. One of the tools being developed is the Mercury Maps. This is a modeling tool used to estimate the impact of reduced air deposition on fish tissue concentration. It is an aggressive tool to help implement the water programs, but it has many limitations. For example, it is not as useful in the western regions, where mercury pollution comes from mining runoff.

In terms of the future, the water program is trying to be creative in using the TMDL program, which is required under the Clean Water Act to address mercury. The TMDL program is not a perfect fit, so the water program is trying to find an innovative way to use it. The water program also focuses on pollution prevention techniques to address point sources such as Publicly Owned Treatment Works and industry (e.g., dentistry). The upcoming Mercury Water Quality Criterion Implementation Guidance will help states and tribes incorporate the fish tissue guidance into the permitting programs.

Generally, the Toxic Release Inventory (TRI) data indicate a continuing decline in point source discharges into water. Since 2000, there has been a 50 percent decline. Air releases, however, remain the major challenge.

Dr. Rita Sheony (Office of Water, EPA) added that the Methylmercury Human Health Criterion was issued in 2003. This is part of a program whereby EPA helps states and tribes set their own standards under the Clean Water Act for controlling point discharges of mercury, or any material, to water bodies. In 2001, the document was based on fish concentration rather than a water concentration. The real problem is methylmercury concentration in fish, not mercury in water. Mercury accumulates one to ten million times as methylmercury in fish tissue. The guidance explains how to work with a fish tissue criterion. For example, how many samples should be taken; what kind of fish should be sampled; how frequently; how to determine whether a situation is improving or worsening, etc. It also addresses situations in which fish cannot be sampled. EPA has been developing this guidance for several years. The guidance is under review by the Office of Management and Budget (OMB).

In terms of trends, there is a steady increase in mercury releases to land. According to TRI data, there was a 20 percent increase from 2000 to 2002. Surface impoundments and other land disposal from mining are believed to be the cause. In 2002, 90 percent of all mercury releases to land came from three mines.

Although there are significant amounts of mercury being released to land, EPA does not consider land releases as environmentally harmful as releases to air. However, because of these increasing trends, EPA needs to expand its efforts to investigate and characterize mercury releases and risks from mine tailings and other sediments. These efforts will be included in future activities.

Reducing Mercury Uses in Products and Processes

The Agency also is working to remove mercury from waste streams through recycling and by reducing its use in products. This is a key component in reducing releases to air, water, and land. Much has been accomplished, primarily by removing mercury from batteries. From 1980 to 1987, there was an 83 percent decrease in mercury in products. Currently, 40 percent of the mercury used in products is found in wiring and switches. Measuring devices, such as hospital instruments, account for 28 percent. Other significant uses of mercury include lighting and dental products. EPA is evaluating voluntary and regulatory approaches for reducing mercury in products. For example, the Toxic Substances Control Act (TSCA) provides regulations to encourage substitution of mercury in products and processes. Several voluntary approaches with the medical industry also have proved to be very successful. Hospitals for a Healthy Environment and a collection program for dental amalgam are two examples.

Managing Commodity-Grade Mercury Supplies

As policymakers, it is important to retire excess mercury supplies safely and permanently. EPA is under pressure from states and local governments to address future mercury storage. Currently, mercury is sold in the global commodities market; approximately 50 percent of this comes from mining, and the rest comes from secondary sources such as industrial wastes, scrap products, mining by-products, and recycling. In Europe, excess mercury from chlor-alkali plants is sold to mines for resale, reducing the need for mining. As industries phase out their use of mercury, the supply of commodity-grade mercury is expected to increase. EPA will work with international, federal, and state officials to understand the relevant economic and policy issues. The goal is to approach the issue holistically (e.g., by increasing recycling as well as reducing the demand). ORD is researching long-term mercury storage options, including the use of monofills instead of above-ground facilities, which currently are used.

Risk Communication

Public awareness is one of the most effective tools for reducing mercury exposure in humans. EPA and ORD are working to enhance communication strategies, including educating the public about non-dietary sources of mercury in addition to publishing fish advisories.

Reducing International Sources

Recognizing that mercury is a global issue, EPA is involved in several bilateral, regional, and international programs and agreements to reduce mercury uses and releases and improve risk communication. This collaboration is critical to understanding global sources, international transport pathways, and international impacts. EPA's collaborative efforts include:

- ✧ United Nations Environment Program (UNEP)
- ✧ Commission for Environmental Cooperation North American Regional Action Plan
- ✧ United Nations Economic Commission for Europe Convention on Long Range Transboundary Air Pollution Protocol on Heavy Metals
- ✧ United Nations Industrial Development Organizations Global Mercury Project
- ✧ Arctic Mercury Project

Currently, the U.S. government is proposing an international mercury framework for the UNEP mercury program to enhance the program, achieve more direct reductions, and build partnerships with key sectors (e.g., mining, chlor-alkali, utilities, and products).

Conducting Research

EPA is conducting a significant amount of research, which provides critical scientific support to the program offices as they consider regulations related to mercury. ORD's focus areas are consistent with the future direction of the programs: understanding fish tissue and its relationship to air deposition, characterizing mining releases, evaluating mercury-specific control technologies, and assessing the efficacy and cost effectiveness of multipollutant control technologies for combustion. The future focus of research continues to be the control of utility emissions.

Mercury Monitoring

Several monitoring programs are in place to measure the effectiveness of EPA's programs. The Agency's future direction includes increased communication of these data to the public. Key indicators of long-term trends include air emissions, air deposition, water quality/fish tissue, and human tissue. Recent EPA reports that translate mercury monitoring data include *America's Children and the Environment: Measure of Contaminants, Body Burden, and Illness* and EPA's draft *Report on the Environment.* Future reports include the final results of EPA's National Fish Tissue Study (scheduled for 2006), the new National Health and Nutrition Examination Survey, and EPA's *Report on the Environment 2006.* These are part of EPA's ongoing commitment to educating the public on mercury issues and trends.

Questions

Dr. Windom asked where ORD's responsibility ends and other offices' begins. He asked about ORD's role in regard to monitoring, specifically air monitoring and capacity building, and added that air monitoring will continue to be important, particularly as air emissions are reduced. In addition, background air quality issues will involve international agreements. How involved is ORD with monitoring and capacity building? Dr. Windom added that ORD is not responsible for developing air quality monitoring networks, but it might be the right organization to be involved with capacity building (i.e., to ensure EPA has people who can monitor air). That capacity does not exist in the United States to a high degree, nor does it exist in other countries that EPA may wish to collaborate with in the future.

Ms. Wilson replied that, in her opinion, ORD should support these efforts as far as possible. Regarding capacity building, it would be beneficial for ORD to collaborate with other agencies and other governments to help set up national emissions inventories. From her perspective, which is a program office perspective, she does not see a line that ORD should not cross. ORD might, however, have a mission to stay within certain boundaries.

A participant explained that ORD defines its role as being research (i.e., testing hypotheses about the laws of nature). They do not engage in routine monitoring, which means tracking changes in air or water levels. That, roughly, is where the line is drawn. To do the research, the monitoring methods are needed. Method development is very much in the ORD purview. Operating routine tracking systems, however, belongs to the program offices.

Dr. Windom agreed that ORD is responsible for method development and validation. However, although excellent methods have been developed, they are not implemented extensively. For example, many states do not have the capacity to measure mercury adequately in air or water. He added that it might not be ORD's job to do that, but if ORD produces a new analytical technique, who markets that product? It is extremely important to market these products, even though there is not a lot of money to do so.

A participant stated that marketing, generally, is done by the program offices. Typically, they would require that state agencies use one of the approved monitoring methods. The problem is that there is not a lot of money to give the states to do this.

Dr. Schoeny commented that marketing was referred to as technology transfer. William Stelz (National Center for Environmental Research, EPA) added that the goal of the Small Business Innovation Research (SBIR) program is to bring new technologies to the marketplace. Some of this has been done for mercury and continuous emission monitoring; so, indirectly, some marketing is accomplished through the SBIR program.

Dr. George Lambert observed that there was an apparent discrepancy between the wide range of mercury issues to address and the low level of resources (i.e., eight full-time employees [FTEs] and $5.5 million). Dr. Schoeny replied that EPA conducts other mercury activities in addition to the work reflected in the research plan. For example, in the area of risk assessment, there are other FTEs involved in both human health and the ecology. A later presentation will discuss air and water monitoring. The fish advisory program is a facilitation function for EPA to help the states. In terms of research, EPA also works collaboratively with other agencies.

Another participant added that EPA has been on the cutting edge in developing instrumentation and approaches for mercury speciation. A large part of capacity building is empowering other countries to take measurements. For example, EPA is training individuals from China at a research monitoring station. EPA has been and should continue to be at the forefront of this kind of international information and technology transfer. Dr. Windom noted that this should be articulated in the MYP.

Dr. Cindy Gilmour commented that the MYP is a good document that reflects the content of the 1997 Report to Congress and the Research Strategy, but agreed with Dr. Lambert that the resources are insufficient to meet EPA's goals.

Dr. Gilmour recalled a recent conference call with the U.S. Geological Survey round table on monitoring. The Office of Air (OAR) had sponsored a workshop 18 months earlier to discuss long-term mercury monitoring. The focus was more than deposition; it included air, water, fish, animals, and human health. A book is expected to be published this year. During the phone discussion, Dr. Gilmour stated that Arnold Kuzmack had commented that EPA is considering how to do monitoring internally. She asked him two questions about monitoring: What will EPA's research funding level be for 2006 and beyond? How much of the planning of nationwide monitoring is within ORD's purview? He replied that he was referring to routine monitoring, which would not be ORD's responsibility. However, ORD is involved with developing the strategy, and there are particular research requirements, such as developing a dry deposition method. Funding is a problem, so the extent of the effort is uncertain. Dr. Gilmour reiterated that the mercury planning effort is affected by these funding limitations. In conducting this MYP review, it is important for the subcommittee to understand how many of the activities are funded by EPA.

Dr. Windom replied that MYPs are developed with the resources that are available. In addition to proposing a plan, the document should track the funding that was provided, the activities that were accomplished, the activities that were not accomplished, and the reasons they were not accomplished.

Dr. Rogene Henderson asked how EPA is addressing the problem of sensitive populations such as children and unborn fetuses. Who is addressing this issue if EPA does not have the funds? Dr. Shoeny replied that EPA is not doing much beyond the risk assessment work. The major funding for the long-term studies has come through the U.S. Department of Health and Human Services (DHHS) and the National Institutes of Health (NIH). The studies are very expensive and very critical to our understanding. Other governments have contributed money as well, particularly those countries that have a high consumption of fish.

Dr. Windom noted that although fish and seafood are two separate issues, they are considered together in the MYP. Dr. Schoeny replied that EPA, in terms of testing and advisory development, historically has concentrated on freshwater fish and on recreational fishing. With help from the U.S. Food and Drug Administration (FDA), they expanded into other areas, including estuarine fish and coastal marine fish. The EPA/FDA fish advisory released last year concerns commercial fish, including large ocean-going fish, and fish caught by family and friends. These are considered separately in discussions of risk assessment and exposure

assessment. However, in terms of advice, they are considered together. The advisory is structured toward the fish that people actually eat. Another participant commented that much of our seafood comes from fish farms in other countries.

Dr. Gilmour asked if the subcommittee was limited to reviewing the MYP or if it should look more broadly at EPA's mercury research planning and regulatory activities. Dr. Windom answered that the subcommittee is reviewing the MYP as a document for communicating the ORD program (i.e., where it has been, where it is heading, etc.). The subcommittee is not trying to critique the mercury research program; that is a different effort. The subcommittee should be commenting on how the document addresses the issues in the charge questions. The task is to make recommendations to EPA for improving the MYP process.

Dr. Gilmour suggested that the most important task is to assess whether EPA is doing the research they need to do to meet the regulatory needs. Dr. Windom replied that the subcommittee is not constrained from addressing that, but with the amount of time available to do the review, the primary focus has to be on improving the MYP process.

RECAP OF THE JANUARY 19, 2005 MERCURY MYP CONFERENCE CALL
William Stelz, National Center for Environmental Research (NCER), EPA

Mr. William Stelz provided a recap of the January 19, 2005, conference call and a discussion of NCER's Science To Achieve Results (STAR) Mercury Research Program, the National Exposure Research Laboratory (NERL), some future directions, and communication tools. PowerPoint slides of his presentations are included in Attachments 4 and 5.

The Mercury MYP supports Goal 4 of EPA's Strategic Plan: Multimedia/Healthy Communities and Ecosystems. The MYP was based on the Mercury Research Strategy, published in September 2000, which focused on reducing uncertainties associated with assessing and managing mercury risks. Mr. Stelz provided a poster that outlined the major mercury issues captured in the Mercury Research Strategy and presented ORD's responses to the problem. The MYP reflects the principal components of the research strategy, including sources, control technologies, environmental fate and behavior, and ecological and biological effects. The MYP also focuses on cross-component activities such as measuring, modeling, and monitoring.

The MYP development begins with the Agency's strategic direction. Next, key science questions are identified to be addressed by research. From these, long-term goals (LTGs) are developed along with a time-frame and roles and responsibilities for ORD and others. The activities in the plan require leveraging resources with other parts of EPA as well as other agencies. Next, annual performance goals (APGs) are established and sequenced to meet the LTGs. Annual performance measures (APMs) are developed to ensure that the work can be accomplished with the available resources as well as to determine which laboratory, center, or other entity will perform the work. The APMs are reported quarterly.

Mr. Stelz reviewed the logic diagram, which lays out the research program, the clients, and the results from a planning and implementation standpoint. The planning begins on the right side of the diagram with long-term outcomes and works to the left, with resources as the last

consideration. Implementation, however, works from left to right, beginning with available resources and working toward long-term goals. Most of the action takes place in the area of the short-term outcomes. This is where ORD responds to clients' needs. The clients use the short-term outcomes to make key decisions and actions. Mr. Stelz presented an example of a logic diagram specifically for mercury research. He explained that logic diagrams can be developed at many levels, for entire plans or for individual LTGs. They are designed to be used as "thinking tools" to lay out a research program.

Mr. Stelz pointed out that the Mercury MYP relates to many other MYPs. He then presented the key science questions in the Mercury MYP. In concluding his recap, he noted the numerous EPA offices and other federal agencies that are coordinated with EPA's mercury research.

STAR MERCURY PROGRAM
William Stelz, National Center for Environmental Research, EPA

The STAR mercury program has issued two significant Requests for Applications (RFAs). The first RFA concerns fate and transport in watersheds; the second concerns atmospheric chemistry and fate and transport issues in the atmosphere.

Two LTGs and 12 APGs are defined in the MYP. The STAR mercury grant RFAs address both of the LTGs and cover six of the APGs. NCER mercury research also supports other research pertaining to Goal 4 of EPA's strategic plan.

Mercury RFAs

In 1999, in response to a request from the Office of Water to understand fate and transport in watersheds and help with the TMDL research, an RFA was issued and nine grants were funded for a total of approximately $7 million. The next RFA was issued in 2001, which focused on fate and transport in the atmosphere and atmospheric chemistry. Seven grants were funded for a total of approximately $5.7 million.

The 1999 mercury research focused on mercury transport in a watershed context. The objectives were to: (1) increase the ability to trace mercury from its entrance into the ecosystem through its biogeochemical cycling to the concentration of methylmercury in fish tissue, and (2) promote the development of risk management strategies based on sound science. Two key science questions were addressed:

- ✧ For a given amount of mercury transported into a watershed, what is the predicted concentration of methylmercury in fish? How do mercury and methylmercury spatially distribute across the terrestrial and aquatic components of a watershed?
- ✧ What environmental and biochemical variables control transformation of mercury to methylmercury?

The 2001 STAR mercury solicitation focused on the atmosphere. The objectives were to: (1) increase understanding of mercury emissions to the air and the atmospheric processes that affect the transport, transformation, and deposition of those emissions, and (2) develop improved

models of the emission, transport, transformation, and fate of mercury in the atmosphere to estimate the response to emission reductions.

The key science questions to be addressed were:

- ✧ What fraction of the atmospheric mercury depositing to sensitive ecosystems in the United States is emitted from anthropogenic sources within the United States?

- ✧ What sources and/or source categories are most responsible for the atmospheric mercury depositing to sensitive ecosystems? What decrease in atmospheric mercury deposition can be expected from emission controls on various segments of the domestic industry?

The STAR 1999 and 2001 mercury research grant projects address numerous specific questions related to the key science questions. All of these grants are fully funded, and this work will come to fruition over time. Many of the 2001 grants have 2008 APMs; the 1999 grants are finished.

Major NCER Research Activities

Major NCER activities in the MYP starting in 2004/2005 include two APGs:

- ✧ Provide an assessment of key fate and transport issues for tracking the fate of mercury from sources to concentrations in fish tissue.

- ✧ Assess the risks of mercury exposures to ecological receptors.

Most of this work was completed in 2004, although there is some work continuing on a mining grant that will be completed in October 2005.

Three APGs are in place for 2006 through 2010:

- ✧ Provide information and data to support regulations for non-combustion sources of mercury.

- ✧ Develop information on sources of mercury emissions including the regional/global atmospheric fate and transport of such emissions.

- ✧ Produce an integrated multimedia modeling framework for understanding mercury fate from source to fish concentrations.

The last APG is a culmination of the work performed by NCER, NERL, and the National Risk Management Research Laboratory (NRMRL).

Mr. Stelz presented summaries of STAR and NERL research accomplishments, which are included in the slides in Attachment 5. In addition, the SBIR program issues contracts, not grants, to develop technologies that will be implemented and marketed commercially.

Mercury Communication

The MYP is designed to plan research; in addition, it is important to communicate the research that has been accomplished. Mr. Stelz stated that the NCER STAR RFAs are competed and advertised on the NCER web site; along with grant abstracts, progress reviews and annual and final reports.

A document that will synthesize the results of all of the 1999 mercury grants will be completed soon. The same process will take place for the grants in the 2001 RFA. The first progress review will occur in September 2005, in coordination with a major air quality modeling meeting.

The goal is to communicate the research to the people who will be using it, to show ORD's accomplishments, and to demonstrate ways in which the work is being leveraged.

Future Directions

Mr. Stelz stated that the **potential** future directions for NCER could included:

- How do we strike a balance between ecological and health effects research?
- Further research on the source of methylmercury in top predators in the pelagic marine food chain.
- Isolating the microbial populations (specific strains of bacteria) in different ecosystems that are responsible for mercury II methylation. More on the actual mechanism of methylation.
- Uncertainties on the atmospheric fate and transport side related to reactions in the atmosphere that result in the oxidation of elemental mercury to form reactive gaseous mercury. Fiscal year 2001 grants will shed some light on this as well.

Questions

A question was asked about using the APGs and LTGs to demonstrate that the MYP is being followed. Mr. Stelz explained that his presentation was from an NCER and NERL standpoint. The 1999 RFA was issued before the first plan was developed. Those grants were aligned with the MYP, so they were moved into LTG 2. All of those grants came to fruition in fiscal year 2004, including a no-cost extension of one year for several of them. The life of a grant is 3 to 4 years. When grants are used in the context of an MYP, a span of 5 years is assumed from the start of the RFA to the time the APM will be met. An APM is written with the expectation that a report or something similar will be produced. Generally, the grants are viewed together. Occasionally, a specific grant will be separated and included in another APG. For example, the non-combustion mercury grant (dealing with mining impacts) was taken from the 1999 RFA and included in an APG that was involved with non-combustion sources. The planning group decides collectively where each APM should be placed to support other ongoing work and to leverage resources.

In response to questions about the process, Mr. Stelz referred to the logic diagram. The goal is identified first; the planning works back from that. A participant asked about planning for STAR research. The APMs identify which laboratory will perform certain activities, therefore, it seems that and STAR activities should be articulated are in the MYP. For example, LTG 2 identifies significant NCER activity, which refers to STAR grants, and in some cases, specific grants are identified as APMs

It was suggested that the MYP show the rationale for developing new APMs. Are they driven by new understanding, results of past research, or other concerns? Dr. James Avery (Office of Science Policy, EPA) explained that some MYPs include a flow diagram showing the interrelationship of the APGs and the APMs and how the timing and sequence leads to an LTG. There is an accomplishments report and a section on changes from year to year. The planning summaries, or research summaries, are additional source documents that show how the program has changed from year to year. Dr. Windom suggested that this information could be combined in one document with very little effort. That would be a valuable recommendation.

Dr. Henderson commented that the LTGs and APGs were reasonable, but the APMs seemed artificial and somewhat disconnected to the plan. She commented that the absence of an APM in a subsequent MYP is not a guarantee that the APM was completed, and she was uncomfortable with that assumption. It would be preferable to have the document state which APMs were completed. Mr. Stelz replied that the status of each APM is reported annually to the Office of Resources Management and Administration. When they are completed, a summary is written. If they are delayed or not completed, explanations are required. Dr. Henderson commented that she could not find that information. Dr. Windom agreed that subsequent MYPs should indicate which APMs have been accomplished. Each MYP should include APMs and APGs that have been accomplished and new ones that are being proposed. This could be done fairly simply to make the MYP a living document.

Dr. Gilmour asked about the structure of the mercury planning team within EPA and ORD. Mr. Stelz answered that the planning team consists of representatives from each laboratory and center, program offices, regions, and a lead person or chair. This is under the multimedia Research Coordination Team (RCT). There are separate planning workgroups under the multimedia RCT. Mercury falls under that purview, and Mr. Stelz is leading that planning workgroup. Weekly conference calls are conducted with the chair of the RCT during the planning process. The planning workgroup sets its own pace for meeting requirements set by ORD and OSP. Mr. Stelz leads the mercury workgroup, but the MYP is specific to ORD.

Dr. Gilmour asked whether the planning workgroup also constructs the MYP. Mr. Stelz explained that they are responsible for revising it, based on the input from all the members and the guidance issued by OSP. Every planning year has guidance, which changes. Each group is asked to follow that guidance as much as possible. Dr. Gilmour asked how the workgroup plans for the next budget cycle using an outdated planning document. Mr. Stelz explained that the next revision of the MYP begins with this document. It is revised to reflect the science advancements, Agency priorities, budgets, and planning guidance. Dr. Gilmour expressed concern about the difficulty of planning for 2006 and 2007 using a 2003 document. Dr. Windom explained that it is a planning

tool and a way to communicate the direction of the program to outsiders. Dr. Windom suggested modifying the plan annually by revising tables in the back of the document.

THE MERCURY COMBUSTION PROGRAM

Introduction

Doug McKinney, Assistant Laboratory Director for Air, NRMRL, EPA

Mr. McKinney and his colleagues presented information about ORD's mercury combustion program. The objectives of the presentation were to: (1) highlight mercury combustion research and development within LTG 1 of the MYP (i.e., to reduce and prevent release of mercury into the environment); (2) present the accomplishments; and (3) discuss future directions.

Coal combustion is a major source of mercury, both domestically and internationally. Regulations have been promulgated in the United States to control mercury emissions from incinerators and power plants. However, development of mercury control technology for coal-fired utility boilers is still ongoing and there is considerable focus on control of mercury emissions from overseas sources. EPA's expertise can assist in both of these areas.

Reducing mercury emissions is extremely complex and requires information and coordination from many sources. The ORD mercury combustion program is coordinated with numerous collaborators and stakeholders. In addition to supporting primary clients within EPA, ORD's research is integrated with other agencies, industries, and foreign governments. There are three major components of the ORD mercury combustion program including development of control technologies, measurement of mercury emissions, and evaluation of the potential for re-emission from coal combustion residues.

Mr. McKinney introduced his colleagues' presentations: Control Technology, by Ravi Srivastava; Continuous Emissions Monitors for Coal-Fired Power Plants, by Jeff Ryan; and Coal Combustion Residues, by Susan Thorneloe. PowerPoint slides of the combined presentations are included as Attachment 6.

Control Technology

Ravi Srivastava, NRMRL, EPA

Ravi Srivastava restated that the major focus areas of the mercury combustion program were control technologies, measurement of emissions at powerplants, and residues. He presented an overview of control technologies for coal combustion plants.

The first major control method takes advantage of existing air pollution controls at coal-fired boiler plants. As coal and air enter the boiler, coal is combusted at very high temperatures. The resulting flue gas contains pollutants such as nitrogen oxide, sulfur oxide, particulate matter, and others, including mercury. As the flue gas travels through the exhaust system, the pollutants are removed by a series of control devices. For example, selected catalytic reduction (SCR) is used to

reduce nitrogen oxide. Electrostatic precipitators (ESPs) and fabric filters (FF) are particulate control devices. Wet scrubbers are used to remove sulfur dioxide (SO_2).

These pollution control devices also remove some mercury. During combustion, mercury is released as elemental mercury vapor. As the mercury cools, it starts to react with flue gas components. It partitions into three forms at the exhaust of the boiler: elemental mercury vapor, oxidized mercury compounds, and particulate-bound mercury. This partitioning is referred to as speciation. Particulate mercury is relatively easy to remove with particulate control devices. Other devices are required for the gaseous forms (i.e., elemental and oxidized mercury compounds). The most predominant oxidized mercury compound is mercury chloride. Fortunately, this compound is soluble and can be removed in the wet scrubber.

Elemental mercury vapor is more challenging. SCR has been found to oxidize some of the elemental mercury in oxidized form. This device works for bituminous coal. A combination of wet scrubbers and SCR devices can reduce a significant amount of mercury from bituminous coal-fired boilers. Several other factors influence mercury control, including coal type, time/temperature profile, flue gas composition, and fly ash characteristics.

The second major control method involves dedicated mercury control technology. The most advanced control technology is activated carbon injection. All power plants have particulate control devices in place. Generally, these are ESPs. A sorbent, or an absorbent powder, is injected in the flue gas before it reaches the ESP. The sorbent captures the mercury and, as particulate matter, is captured in the ESP. Another option is to install a fabric filter after the ESP. Sorbent is injected into the flue gas after it goes through the ESP. The sorbent combines with the mercury and is captured in the filter. The advantage of this latter method is that it does not contaminate the fly ash that is captured by the ESP, as some plants sell their fly ash. The other advantage is that fabric filters are more effective at capturing mercury than ESPs; consequently, less sorbent is required.

As sorbent injection technology advanced, it was found that halogens plays a key role, which led to the development of halogenated absorbents. One of these sorbents was developed through EPA's SBIR program. The halogenated sorbents appear to have the potential to be more cost effective.

Currently, ORD is working with the U.S. Department of Energy (DOE), the Electric Power Research Institute, and others on numerous mercury control development projects. ORD's research efforts have made several contributions to EPA science. In April 2003, a comprehensive assessment of the state-of-the-art mercury mitigation technology was released. This report has become a reference document in this area. Key parameters associated with SCR-enhanced mercury control have been characterized. ORD is working with vendors and others to further develop SCR-enhanced controls. In addition, the research has identified parameters that impact mercury capture in wet scrubbers. Wet scrubbers are projected to be used more extensively to remove SO_2 from power plants, so improvements in this technology could have a major impact.

ORD also has provided support to OAR during the development of mercury and multipollutant regulations. ORD provides guidance on mercury control technologies to states, regions, and other

organizations, such as the National Wildlife Federation. ORD works closely with DOE and other parties, and is organizing an international workshop in China on mercury control technologies and related subjects. Future, mercury combustion research will inform compliance decisions, stimulate development of more cost-effective integrated control options, and help other countries understand how to mitigate their mercury emissions.

Continuous Emissions Monitors for Coal-Fired Power Plants
Jeff Ryan, NRMRL, EPA

Mercury measurement is very difficult and complex. The past few years have seen significant progress in measuring mercury emissions. These measurements are necessary for developing and evaluating the control technologies. They are important for regulatory applications and for international emissions inventories. The research includes fundamental and laboratory research, pilot-plant testing, and field demonstrations.

Continuous Emissions Monitors (CEMs) are a market-based technology. If there is no market, there is no technology. The market is created by regulations. The challenge is to develop a technology that is advanced enough to be used without a regulation. However, to create a market, EPA regulatory offices need data demonstrating performance. As a result, it is a "chicken and egg" situation that applies to any new pollution CEM technology.

ORD research has resulted in numerous accomplishments and impacts. For example, mercury monitoring is a critical component of the trading rule and the Clear Skies Initiative. Several pilot-plant and field studies demonstrate current levels of performance and support regulatory compliance. Examples of additional regulatory applications and control technology research applications are included in the presentation slides included in Attachment 6.

Internationally, it will be important to establish cost-effective monitoring techniques. Current research is addressing regulatory, control technology, and international research needs.

Coal Combustion Residues
Susan Thorneloe, NRMRL, EPA

The third major focus area of ORD's mercury combustion program is coal combustion residue (CCR). This work assesses the effects of mercury control technologies on CCRs. It also examines the impact that disposal practices and commercial applications of CCRs have on the fate of mercury and other metals. There are approximately 110 million tons of residues generated from coal combustion. Thirty percent of this is used in commercial applications; the rest is land-disposed. The mercury combustion program assesses the environmental risk associated with increased mercury in those residues.

In land disposal, the major concern is from leaching. Many facilities are unlined. The major finding of the research was that the available data had limited applicability. The range of leach tests in use were not comparable, and there was limited quality assurance or documentation. ORD worked with the Office of Solid Waste (OSW) to develop an appropriate leach testing protocol.

Currently, 11 facilities have been evaluated for total and leachable content for mercury and other metals. ORD now has a better basis for evaluation, particularly for the sorbent injection method mentioned earlier. In addition, they worked with OSW to prepare a memo for the OAR regulatory docket that provides results of the evaluations and explains the concerns.

Based on four facilities where activated carbon injection or brominated sorbents are used, leaching of mercury does not appear to be a concern. There is concern, however, for leaching of arsenic and selenium. The limited data for facilities using wet scrubbers suggest that mercury leaching may be a concern. Several leaching studies are ongoing, and a report will be released in 2006.

Thermal stability studies are being conducted to determine the release of mercury during the production of materials made from CCR and non-CCR components. Future research will examine the formation and release of organo-mercury compounds for anaerobic decomposition of mercury-enriched, land-disposed CCRs. A major goal of this program is to identify potential cross-media transfers from mercury-enriched CCRs. There is significant interest in the United States and Europe in using ash and scrubber sludge. The results of this research could help prevent potential health and environmental problems.

Future outputs will include reports on the activities in progress. The mercury combustion program, to date, has achieved the following outcomes:

- ✧ The critical and comprehensive review of the status of mercury controls has significantly enhanced the ability of policymakers to make informed decisions.

- ✧ CEMs for regulatory and control technology applications have advanced.
- ✧ Protocols have been developed and refined for evaluating cross-media transfers. These protocols are now in use, allowing more informed decisions by stakeholders.

PUBLIC COMMENTS
Amanda Ganong, Consumers for Dental Choice

Ms. Ganong presented remarks on the importance of banning the use of mercury in dental fillings. She noted the hazards to human health and the environment, and the lack of regulatory restrictions on use and disposal of mercury in dental amalgam.

EXPOSURES AND HEALTH EFFECTS OF MERCURY FOR HUMANS
Rita Schoeny, Ph.D., Office of Water, EPA

Dr. Rita Schoeny gave an overview of the health effects of mercury and human exposure. Slides of her presentation are included in Attachment 7. Her presentation was based on a recent presentation to UNEP; EPA has participated in programs such as this and other awareness building workshops. Awareness of mercury hazards is high in the United States.

Mercury is released in several forms to the environment. Mercury from combustion plants is released close to the source, into the regional cycle, and into the global cycle. The chemistry is

complex, but elemental mercury can circle the globe for up to 2 years and come down anywhere. The mercury we produce travels west; the mercury emitted in China arrives here. The whole world is involved in the cycle. When mercury is deposited in soils and submerged sediments, bacteria can convert it to methylmercury. The methylmercury travels up the food chain, becoming more concentrated as it moves up the chain.

The major exposure pathways for elemental mercury vapors in humans include dental amalgams, occupations such as mining and chlor-alkali plants, religious and cultural practices, accidental spills, and other incidents such as children playing with mercury. For methylmercury, human exposure is through consumption of fish and marine mammals. Humans also are exposed to other forms of mercury through certain foods (e.g., wild mushrooms), traditional Asian medicines, and certain ~~skin~~ cosmetics.

Elemental mercury vapor is extremely toxic. The main route of exposure is through inhalation. It readily crosses the blood-brain barrier and placenta, and high exposures can cause death. The nervous system is the primary target of toxicity; the kidneys also are affected.

Methylmercury is the major type of exposure for humans. Studies show that there is a spectrum of health effects (depending on dose), from severe effects, including death, to subtle effects on the ability to learn. The developing nervous system is a sensitive target for mercury exposure. Recent research human studies have focused on establishing a threshold for effects. EPA has used these data to calculate a reference dose (i.e., the amount of material that one can consume daily throughout a lifetime without expectation of harmful effects, even in sensitive populations). EPA has determined the reference dose to be 0.1 micrograms per kilogram per day. Current studies suggest that mercury exposures near the reference dose could have adverse effects. These could include cardiovascular effects from adult exposure.

EPA does not want to discourage fish consumption; however, people who eat large amounts of fish and/or marine mammals are at risk of exposure to methylmercury. Women of childbearing age have the potential to expose the developing fetus. In addition, children might be at higher risk than adults because of their developing bodies and the higher ratio of food to body weight. Therefore, moderation is recommended.

Questions

Dr. Henderson asked about EPA's role in this effort, considering the limited funds available. Dr. Schoeny replied that the Agency is not sponsoring any large or small health studies; however, they might examine biomarkers.

Another participant suggested that children with neurological disorders should be included in the studies. Dr. Schoeny agreed that some significant studies have eliminated data from children with neurological disorders, which has contributed to significant debate on this issue.

DISCUSSION OF THE CHARGE QUESTIONS

Dr. Windom facilitated the discussion of the charge questions. Each group presented the responses they had prepared prior to the meeting. After these presentations, the subcommittee met in breakout groups to further discuss the charge questions and prepare additional comments for a discussion session the next morning. The final draft of the responses is included as Attachment 2. Highlights of the discussion on the charge questions are presented below.

Question 1: The proposed scope of the work is consistent with: (a) ORD's subject area Research Strategy, (b) the current state-of-the-science, and (c) research by others.

Dr. George Lambert presented comments on his group's response to Question 1. The group found that the Mercury MYP is comprehensive and well planned. It identifies the six critical areas of concern and focuses initially on fate and transport and the reduction of mercury emissions from smoke stacks and disposals. The research is state-of-the-art in the areas that are being pursued.

EPA is aware of research efforts in other federal agencies, universities, and the private sector. The limited funding requires that the program leverage resources by collaborating with other stakeholders. The group suggested that a formal interagency planning group could be established to facilitate this collaboration and resource leveraging. EPA also recognizes that mercury issues are global and require an international effort in research and technology transfer.

Dr. Lambert noted that a recent Science Advisory Board (SAB) review concluded that the resources are insufficient to fund the proposed APMs in the MYP, but added that this statement needs to be confirmed.

Dr. Henderson asked if the intent was to critique the program or the MYP. Dr. Windom replied that the purpose was to review the multi-year planning process, not the mercury program. Dr. Johnson added that the MYP is a subset of the Agency's mercury program.

Dr. Windom asked whether there were any recommendations. Dr. Lambert suggested adding specific examples of potential resource leveraging, such as human health studies at NIH or the Centers for Disease Control and Prevention. Dr. Windom agreed to add the recommendation that the MYP highlight specific examples of possible collaborations.

Dr. Gilmour noted that the MYP does not identify which APGs and APMs are funded solely by EPA and which involve outside funding. Dr. Windom suggested that this information could be added in a separate table. Dr. Gilmour suggested adding more detail to the APMs.

Question 2: The science questions address the most important scientific gaps and uncertainties in the subject area.

Dr. Gilmour stated that the most important scientific gaps and uncertainties were addressed; however, there was still a need for long-term monitoring. It was mentioned earlier that ORD's role is research, not monitoring. Some monitoring effort would be valuable to ORD.

Dr. Windom suggested adding a phrase from the Mercury Research Strategy to the letter report. The overarching goal of the EPA mercury research program is "to provide information and data

that reduce scientific uncertainties limiting the Agency's ability to assess and manage mercury and methylmercury risks."

Dr. Gilmour considers the LTGs and the APGs to be aligned with EPA's needs; however, the APMs are not sufficient to accomplish the goals or answer the key scientific questions. Dr. Gilmour explained that ORD conducts research to provide EPA with the information it needs to make effective decisions. For many of its decisions, the Agency does not have sufficient information. Dr. Gilmour asked for discussion about the best way to state in the letter report that the MYP does not provide adequate research to meet EPA's needs. The Agency acknowledges that the limited resources will affect ORD's research efforts. Dr. Johnson suggested that it would be appropriate to mention the funding limitations once in the report. The MYP plans for long-term needs, but it should be flexible to accommodate short-term requests. The limited funding does not allow every issue to be addressed.

Dr. Gilmour also mentioned that the current document is out of date, making it difficult to determine whether APMs have been accomplished. Dr. Windom replied that the document is not really out of date because it is written once every 3 years, but there is a need to track accomplishments. He added that there also should be some indication of priorities. The MYP should track completed APMs and include reasons that other APMs might not have been completed (e.g., funding limitations, change in Agency priorities, etc.).

Dr. Gilmour suggested a more positive wording, such as the MYP should be updated more frequently to make it a living document. Dr. Henderson suggested adding tables that could be updated annually.

Dr. Lambert commented that there is a need to define priorities. Dr. Windom agreed that the MYP should include a method of prioritization. Mr. Rui Afonse commented that the APMs appeared to be prioritized by the projected completion dates. Dr. Johnson added that the MYP also is prioritized by goals.

The subcommittee agreed that the LTGs and APGs address the most important scientific questions. The problem occurs at the level of the APMs. The APMs should be tracked and tied more closely to the LTGs and APGs. At times, the APMs are not sufficient to be responsive to the APGs and LTGs. Mr. Afonse asked if this is one question or two; is it a technical problem with the APMs or a problem of limited funding? Dr. Johnson replied that it is both. If there were enough money to do everything, there still would be a few gaps.

Question 3: The long-term goals are relevant to the science needs of the Agency, and the MYP situates the annual research products (APGs, APMs) on a clear path to accomplishing each of the LTGs (and APMs contribute to APGs).

Dr. Henderson reiterated that the LTGs and APMs are relevant to the Agency's science needs and situated on a clear path. She recommended some reorganization to make the document clearer. She suggested stating the research problem comprehensively at first, and then presenting the various efforts to address the problem. Also, the APMs that relate to the same problem could be

combined. The object is to present the science question first, rather than the laboratories that will perform the work. Dr. Windom agreed with this approach.

Dr. Henderson recommended that the APMs related to communicating mercury information to stakeholders be more specific. She also suggested that the APMs related to human health effects should be given a higher priority.

Dr. Henderson reiterated that the MYP should indicate the progress of the APMs. Dr. Windom agreed to include that comment as one of the overarching issues.

Dr. Johnson commented that the rationale for prioritizing the research efforts should be made clear in the document. Dr. Windom agreed and added that there should be tables to track and explain their progress. These also should be included as overarching recommendations.

Question 4: Research products and emphases over the next 5 to 7 years are sequenced appropriately to accomplish goals and meet program and regional needs.

Mr. Afonse based his comments on certain assumptions. The first was that the projected completion dates indicate priorities. The second was that APMs projected to be completed prior to 2005 were completed. He evaluated the sequence of research efforts based on these assumptions, but added that they might not be correct. He also considered whether certain APMs required the completion of prior APMs to be accomplished.

Dr. Windom summarized the comments. Much of the research efforts are sequenced by external conditions such as funding. For certain activities, however, sequencing is more critical, and these should be identified. The activities in the document were sequenced appropriately; the recommendation is to make the document flexible and to indicate which activities need to be sequenced.

Question 5: The MYP is flexible enough to adapt to future science and policy changes.

Dr. Lambert stated that the MYP is considered a living document that is intended to be updated to reflect the current state of the science, resource availability, and emerging Agency priorities. There has been considerable discussion about the funding limitations. Dr. Lambert suggested that the activities should be prioritized so that the MYP can be responsive to funding increases or decreases. Dr. Windom commented that certain issues, such as prioritization, were mentioned frequently during the meeting. This indicates that they are important and should be included as overarching issues. In this case, the recommendation is to emphasize the criteria for prioritizing and sequencing.

Dr. Johnson asked if they should establish some contingency funding. The subcommittee decided against this idea, but reiterated that the process for determining priorities is important and should be included in the MYP.

Question 6: The MYP articulates a strategy that facilitates effective communication and utilization of research products (with domestic and international parties).

Dr. Windom stated that the MYP successfully articulates a strategy for communication with other parties, and that is its purpose. However, the MYP does not provide a clear strategy for marketing the research products domestically or internationally. It also would be helpful to publicize the STAR research efforts.

Mr. Stelz stated that final abstracts from the 1999 RFA are available on the NCER Web Site. Currently, a detailed analysis of the STAR grants is in process. It will be completed in the next few months and distributed through the Web site. The progress reviews in the STAR program are published on the NCER Web Site, as are the abstracts, progress reports, and final reports.

Dr. Windom recommended that the MYP include more details about technology transfer, capacity building, and marketing. These could be added to the text section at the front of the MYP.
Dr. Johnson recommended that the document contain the right balance between being concise and articulating strategies more specifically.

In response to a question about the "domestic and international parties," Dr. Johnson noted that different audiences require different communication strategies. Dr. Windom added that an important part of the communication process is the feedback that is received. The MYP should include a strategy for receiving feedback from the end users of the technology transfer.
Dr. Johnson suggested adding a reference to the proceedings of the BOSC workshop on risk assessment communication, which provides information about effective communication.

Dr. Gilmour asked whether a structure was in place for interagency interaction at a high level.
Dr. Johnson suggested that there should be an interagency planning group to coordinate efforts and leverage resources. Dr. Henderson added that the limited funding necessitates interagency collaboration. The subcommittee agreed that coordination and collaboration with other agencies should be institutionalized in the MYP. This effort also should be proactive. Dr. Windom suggested adding this recommendation to the section on overarching issues. The mercury research program is a large enough issue that it would be worthwhile to establish an interagency council to institutionalize collaboration.

Question 7: There is a clear path for assessing/evaluating the MYP and progress toward its goals.

Dr. Windom expressed that this issue had been discussed extensively during this meeting. He recommended that the MYP track the progress of the APMs and include information about changes in resources, prioritization, etc., in tables that are updated annually. The tables also should include APMs from previous MYPs.

Dr. Johnson added that the tables should include information about outcomes. It is not sufficient to indicate that an APM has been completed, it is important to discuss the actual accomplishments. This should be included as an overarching recommendation.

BREAKOUT GROUPS

Dr. Windom requested that the subcommittee break into groups to discuss the charge questions further, based on the day's discussion, and redraft the responses. He asked the group to write the responses as comments and identify any specific recommendations.

Dr. Windom stated that he would work on the overarching recommendations. The group would meet the following morning to discuss the revised responses to the charge questions.

Thursday, February 24, 2005

Dr. Windom distributed written responses from the previous day's breakout writing session and allowed the participants time to read them. He explained that, ultimately, the letter report they were developing will be a BOSC document; the subcommittee's role is to provide recommendations, particularly in response to the charge questions. Dr. Windom will write the draft letter report, which will be signed by Dr. Johnson. The focus of the current meeting was on substance, not wording. The goal was to reach consensus on the content, which will serve as the basis for the report.

Ms. Drumm requested copies of the participants' travel vouchers and homework sheets.

OVERARCHING ISSUES/COMMENTS

Before addressing the responses to the specific charge questions, Dr. Windom presented several overarching recommendations for the group to discuss: (1) establish an interagency council to facilitate collaboration and leverage resources; (2) establish a method for prioritizing and sequencing APMs; and (3) update the MYP appendices annually.

Dr. Gilmour commented that the letter should begin by stating that EPA's mercury program is "excellent and on target for what the Agency needs." Dr. Windom agreed, but noted the funding limitations. The front part of the letter should state that EPA is doing an excellent job with the funds that it has; however, it is difficult to build a coherent program without adequate funds to address all of the major issues. Because other agencies are involved, and for the sake of the mercury issue nationally, there should be some assurances that the funds that are available are used effectively.

Dr. Johnson considered the recommendation for an interagency council to be within the charge of the subcommittee. Dr. Lambert agreed and added that mercury is such a high national priority and involves so many agencies, that it requires an interagency collaboration. The MYP could be used as a tool to help direct the interagency efforts.

Dr. Henderson commented that EPA's major focus is on fate and transport. She asked whether to include, as an overarching issue, that the lack of funds prevents the Agency from addressing the important issues of human health and ecological effects.

Dr. Gilmour asked whether fate and transport were still the major issues being funded. Mr. Stelz replied that much of the current fate and transport work is nearing completion, with some projects

extending until 2008. The work is continuing, but some of the focus has shifted from watersheds to atmospheric issues. Dr. Windom was reluctant to recommend that EPA direct its efforts towards human health issues. Ecological issues would be more appropriate for EPA; however, the role of the subcommittee at this time was not to make those determinations. They should focus on the MYP process rather than program evaluation.

Mr. Afonse asked if the lack of a detailed communication plan should be included as an overarching issue. The group agreed that it should be.

RESPONSES TO THE CHARGE QUESTIONS

Dr. Windom led the discussion on the Subcommittee's final responses to the charge questions.

Question 1: The proposed scope of the work is consistent with: (a) ORD's subject area research strategy, (b) the current state-of-the-science, and (c) research by others.

In general, it was agreed that the Mercury MYP is comprehensive, well planned, prioritized, and focused. The Agency's current research is state-of-the-art in areas that are being pursued. The Agency is aware of research conducted by others, and recognizes the necessity of collaboration to facilitate research efforts and leverage resources. EPA also recognizes that mercury issues are global and require international cooperation. Accordingly, EPA is reaching out to other countries to address mercury issues collaboratively.

Dr. Johnson recommended moving the second paragraph in the response to Question 2 to the second sentence in Question 1. Dr. Windom agreed and described the quotation in that paragraph as the over-riding philosophy of EPA's mercury research program.

Dr. Henderson questioned the last sentence in Question 1: "An SAB review...has concluded that the resources are insufficient to fund the proposed APMs in the MYP." Dr. Lambert agreed to check the accuracy of the statement and e-mail the results to Dr. Windom.

Question 2: The science questions address the most important scientific gaps and uncertainties in the subject areas.

Dr. Windom repeated that the second paragraph would be moved to Question 1.

Dr. Henderson commented that she and Dr. Lambert concentrated on LTGs only. They concluded that "the LTGs and the associated APGs generally address the most important scientific gaps and uncertainties and are on target to meet EPA's needs. The...APMs, however, do not suggest sufficient research to accomplish the goals or answer the key scientific questions..." The group agreed with the substance of the conclusion and decided to refine the language to emphasize the point further.

Question 3: The LTGs are relevant to the science needs of the Agency, and the MYP situates the annual research products (APGs, APMs) on a clear path to accomplishing each of the LTGs (and APMs contribute to APGs).

It was agreed that the two LTGs are well stated and relevant to the needs of the Agency. The MYP provides a logical approach for organizing the work and evaluating progress toward the goals. The discussion of the approach led to questions about sequencing. The group decided to move the discussion about sequencing to Question 4. Dr. Windom asked Dr. Gilmour to draft the text to reflect this change.

Question 4: Research products and emphases over the next 5 to 7 years are sequenced appropriately to accomplish goals and meet program and regional needs.

In the current MYP, the research emphasis appears to follow a logical sequence over the next 5 to 7 years. Some of the research is prioritized by regulatory demands. Some activities, however, require a sequential approach. The subcommittee agreed that, although the current sequence of activities generally is appropriate, there is a need for a more transparent process for determining priorities and sequences.

Priorities shift according to influences such as funding, completion of other activities, and requests from Congress. It should be clear in the MYP why certain goals are planned farther in the future than others and why some priorities might have changed. The recommendation for this report is that the MYP articulate the criteria used for prioritizing and sequencing. Dr. Gilmour noted that the APGs related to the effects of mercury on human health are not necessarily sequential, but are farther in the future than issues such as fate and transport. Dr. Johnson suggested using this as an example to illustrate the value of articulating the sequencing/prioritizing process.

Dr. Gilmour identified two specific research needs that should be addressed, but currently are not: long-term monitoring and the sequencing and prioritization of human health. She asked if the subcommittee should include these in the report. Dr. Windom recommended focusing on the process rather than the programs; the program evaluation would be handled by another committee. Dr. Gilmour pointed out that they were asked to address these questions and there are obvious gaps. It was agreed that making the process transparent would resolve this problem.

Question 5: The MYP is flexible enough to adapt to future science and policy changes.

Dr. Johnson suggested describing the document as "living" rather than "dynamic." It is clearly stated that the MYP is considered a living document, intended to be updated to reflect changes in the state of the science, resources, and Agency priorities. The MYP has undergone multiple revisions, and additional reviews are planned, including external peer review. The subcommittee decided to minimize references to changes in funding; the transparent prioritization process mentioned above would explain any such changes.

A question was asked about updating the MYP annually. Mr. Stelz replied that the MYP is planned for 3 to 5 years, with some APMs extending further out. Dr. Gilmour asked if an annual update would be out of line with the other MYPs. Mr. Stelz explained that the plans were updated every other year because planning and updating MYPs every year was overwhelming.
Dr. Windom said that the recommendation was to update the APMs annually, not the entire document. The APMs are updated annually for funding, so it is a matter of incorporating that into

the MYP process. An annual update also would provide an effective tracking mechanism. It would demonstrate the progress and provide a means of communicating the accomplishments.

Question 6: The MYP articulates a strategy that facilitates effective communication and utilization of research products (with domestic and international parties).

The first comment was to delete the word "sufficient" from the last sentence in the first paragraph of the responses. In the first sentence of the second paragraph, the words "certainly provided" should be replaced with the word "stated."

There was a recommendation to include a communication strategy for the various stakeholders, including extramural researchers such as STAR grantees. Mr. Stelz commented that the STAR program is trying to communicate its accomplishments more extensively. Dr. Windom replied that the recommendation is to establish a dialog among the various researchers and stakeholders. This communication appears to be taking place, but it needs to be articulated in the MYP.

Question 7: There is a clear path for assessing/evaluating the MYP and progress toward the goals.

Dr. Gilmour suggested that outcomes should be used as a means of assessing progress toward the goals. Dr. Johnson asked whether it was desirable to state expected outcomes and measure progress toward them or simply state proposed projects and indicate whether or not they were completed. Dr. Windom commented that outcomes are closely related to communication. The products have to be marketed and used for the outcome to be effective. Feedback is important for understanding how the product is being used and how it can be improved. Dr. Johnson replied that the expectation is not to develop a report, but rather to answer a science question. The subcommittee agreed that it would not be desirable to predict outcomes and be measured against them. They decided to include language about outcomes in the communication discussion in the response to Question 6.

There was a recommendation to include a table of previous years' APMs in the MYP to provide a tracking mechanism for evaluating progress. An additional recommendation was to include descriptions of the outcomes of the completed APMs (i.e., how they were marketed and used, as well as an assessment of their success). Dr. Windom suggested that the recommendations about outcomes should be raised to the level of an overarching issue. Dr. Johnson recommended that the overarching issues section be limited to less than 2 pages.

FINAL REMARKS

Dr. Johnson thanked the subcommittee members for their participation. He added that when this report has been reviewed by the BOSC, there will be a response which he will forward to the subcommittee. He expects that many of the subcommittee's ideas will be incorporated into the next phase.

Dr. Windom asked for everyone's written responses. Dr. Gilmour will reorganize the responses to Questions 3 and 4, and Dr. Lambert will confirm the comments from the SAB. Dr. Lambert

provided a letter from Bill Glaze to the Administrator stating that the funding for mercury was reduced at a time when more funding was needed. Dr. Lambert will send that reference to Dr. Windom.

Dr. Windom requested that additional comments be sent to him. He expects the conference call on March 29 to go smoothly. A draft of the document will be released for public comment before the conference call. Dr. Windom thanked the participants and adjourned the meeting.

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